

# Jackson Prairie Gas Storage

Washington State Utilities & Transportation Commission  
Citizens Committee on Pipeline Safety

David Mills – Vice President, Energy Operations

Ron Roberts – Director, Thermal Resources

Pat Haworth – Manager Jackson Prairie

March 22, 2016



# Jackson Prairie - History

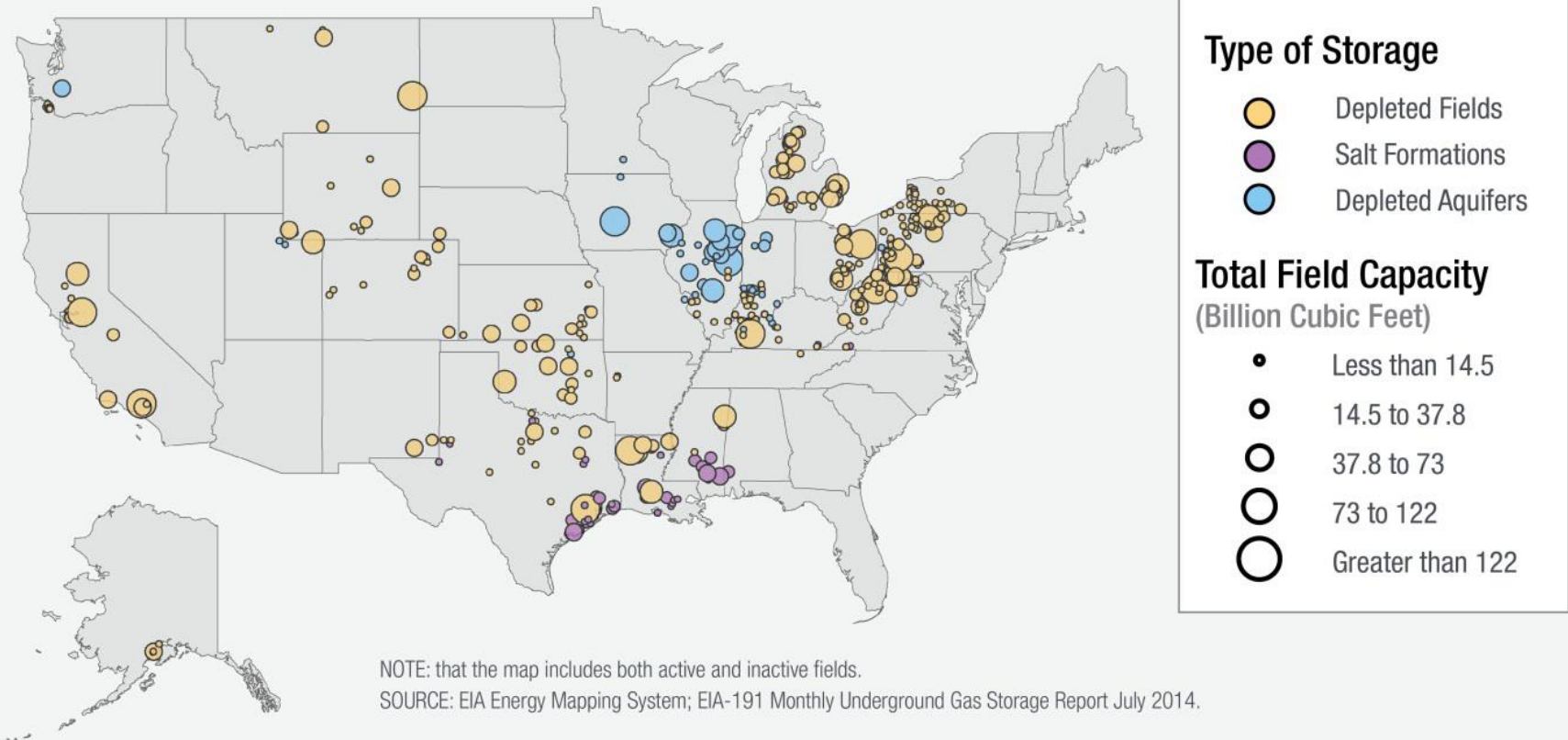


- 🔥 The first exploration well was drilled in 1958, to a depth of 8015 ft, by Continental Oil Company, looking for Natural Gas (dry hole)
- 🔥 In 1962, a partnership was formed by the predecessors of Puget Sound Energy, Avista Corp, and Williams Gas Pipelines to explore storage possibilities
- 🔥 Gas was first injected in January of 1964

# U.S. Storage Fields

## Where Natural Gas Underground Storage Fields are Located

Type of Storage and Total Field Capacity, July 2014



# Jackson Prairie – Key Statistics

➤ *45% of PSE's peak-day supply*

PSE Peak Withdrawal	454,000 Dth/d
PSE Working Gas	9,850,000 Dth

➤ *25% of the region's peak-day supply*

JP Peak Withdrawal	1,096,000 Dth/d
JP Working Gas	25,584,000 Dth
JP Total Stored Gas	48,776,000 Dth
Energy equivalent to 2 Grand Coulee Dams	

## Facility

- 55 gas wells (1,200-2,800 feet deep)
- 104 total wells drilled to-date
- 33,000 HP of compression (8 turbines)
- 925 acres owned
- 3,200 acres leased from 120 landowners
- 8 miles of gathering lines (6" to 24")
- 8 miles of transmission lines (14"/16"/20"/24")

## Staffing

- 16 person staff – staffed 24/7



# Aerial View of Jackson Prairie Compression and Processing Facility



\* 10 miles south of Chehalis, WA

The Jackson Prairie gas storage field lies beneath 3,200 acres of land, but its above-ground facilities require just five acres.

The diagram illustrates the subsurface structure of the Jackson Prairie Gas Storage field. At the top, a landscape view shows a road, trees, and farm buildings. Below this, a cross-section reveals geological layers. A dashed line marks 'Sea Level'. Another dashed line at a deeper level is labeled '-1000' Sea Level'. The top layer is a brownish sediment cap. Below it is 'Gas Storage Zone 1', a reddish-brown layer. Further down is 'Gas Storage Zone 2', a porous sandstone layer. At the bottom is 'Underground water', shown as greenish layers. Four vertical wells are depicted: one in the sediment cap, one in Zone 1, one in Zone 2, and one in the water layer. Labels 'Sand' and 'Water' point to their respective layers. Text boxes provide details about the land area, sediment layers, storage depth, and the sealing effect of the water.

Life proceeds undisturbed in homes, farms and forests lying above the storage field.

Layers of sediment, deposited and compacted over millions of years, form a cap to trap the gas underground.

Sea Level

Gas Storage Zone 1

-1000' Sea Level

Underground water—trapped for millions of years—seals the edges of the storage field.

Gas is stored 2,000 feet deep in porous sandstone—a prehistoric seabed buried by sediment eroded from ancient mountains.

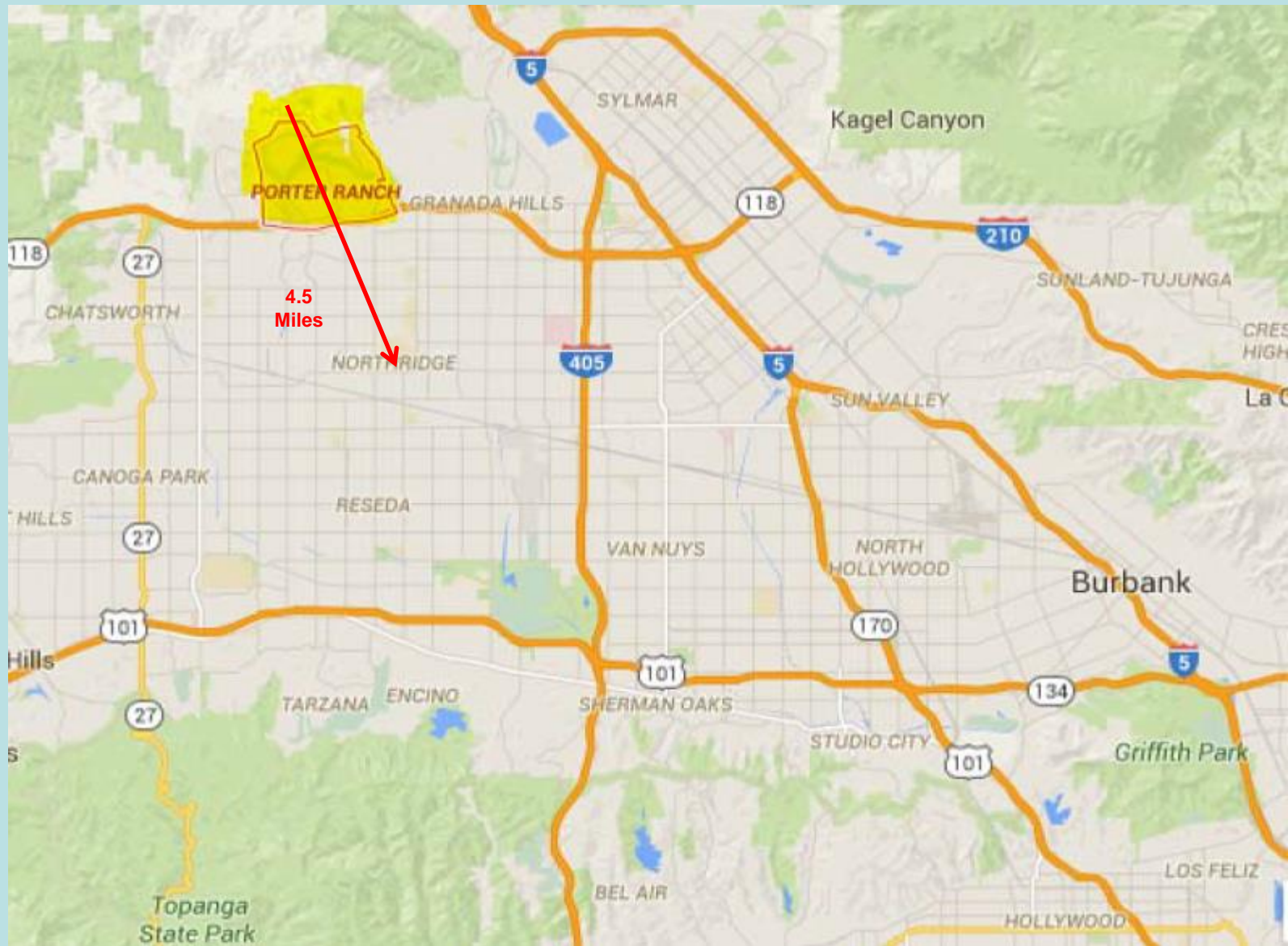
Sand

Gas Storage Zone 2

Water

*Jackson Prairie Gas Storage*

# Aliso Canyon Porter Ranch Location



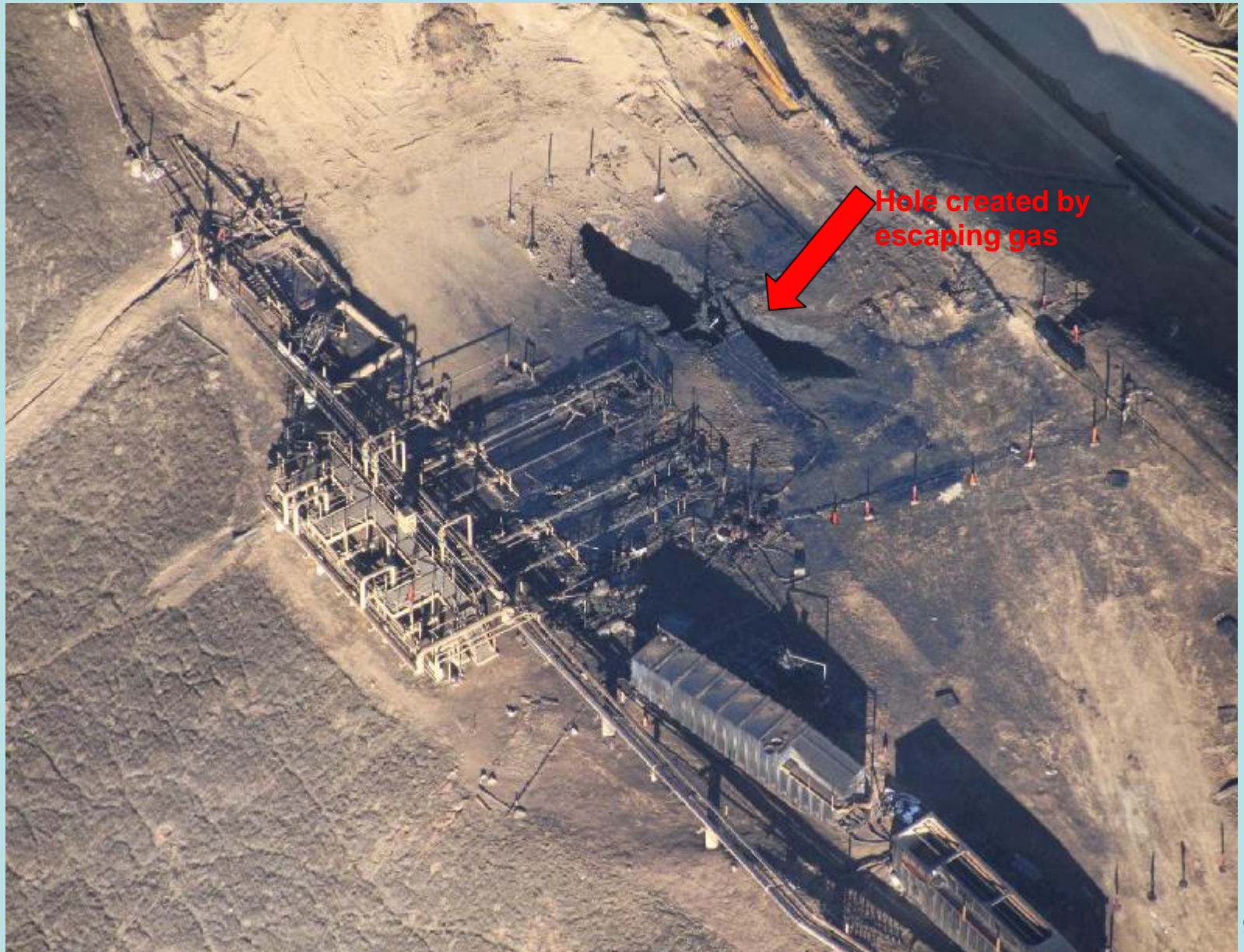
\* Distance from storage field to Cal State Northridge; less than a mile from Porter Ranch community (population 30,000).

# Aliso Canyon Well Failure

## (Owned By SoCal Gas)

- Aliso Canyon Well SS25 Failed on 10/23/15
  - SoCal reported the well failure after three days
  - Failure expected to be ~1,000 feet deep
- Located adjacent to the Porter Ranch Community in Los Angeles, population of 30,000
- Lost an estimated 30,000 Dth/day
  - Gas did not ignite; odorized, raw gas
- Has released a reported 80,000 tons of methane into the atmosphere (daily emissions equivalent to 4 MM cars)
- More than 4,400 households relocated
- Began drilling relief well on 12/4/15
- Well controlled on 2/11/16
- Well permanently plugged on 2/17/16
- LA sued SoCal on 12/7/15; numerous lawsuits or investigations by government entities currently in process
  - LA County filed criminal charges 2/2/16 (for not reporting the failure for 3 days)
- In late January, the CPUC ordered withdrawals from Porter Ranch stopped and the California State Senate passed a moratorium on injections at Porter Ranch until all wells have been inspected

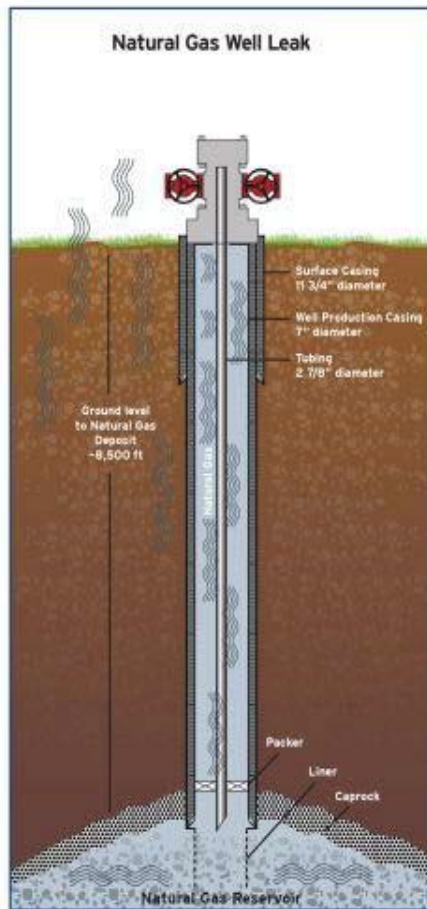
# Aerial View of Port Ranch Well Failure



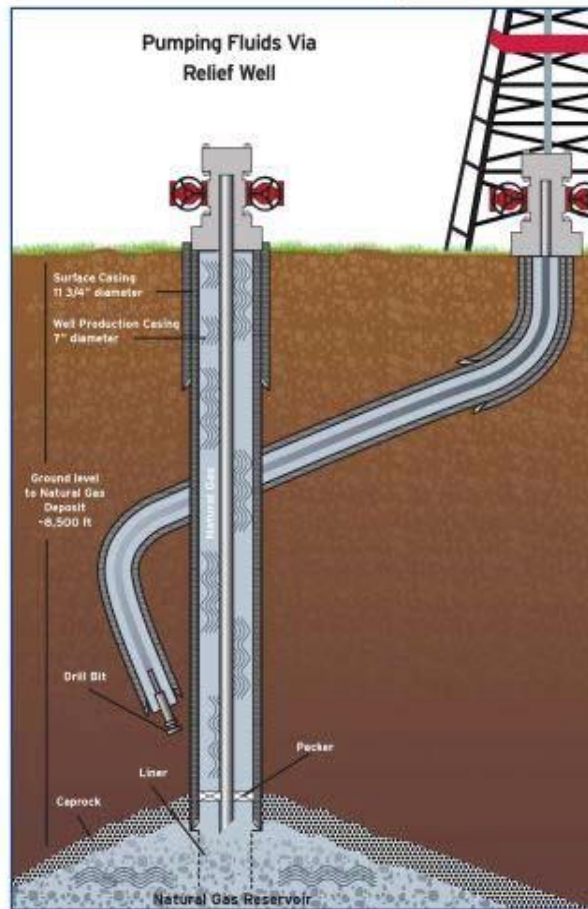
# Aliso Canyon Relief Efforts

COMMUNITY AWARENESS

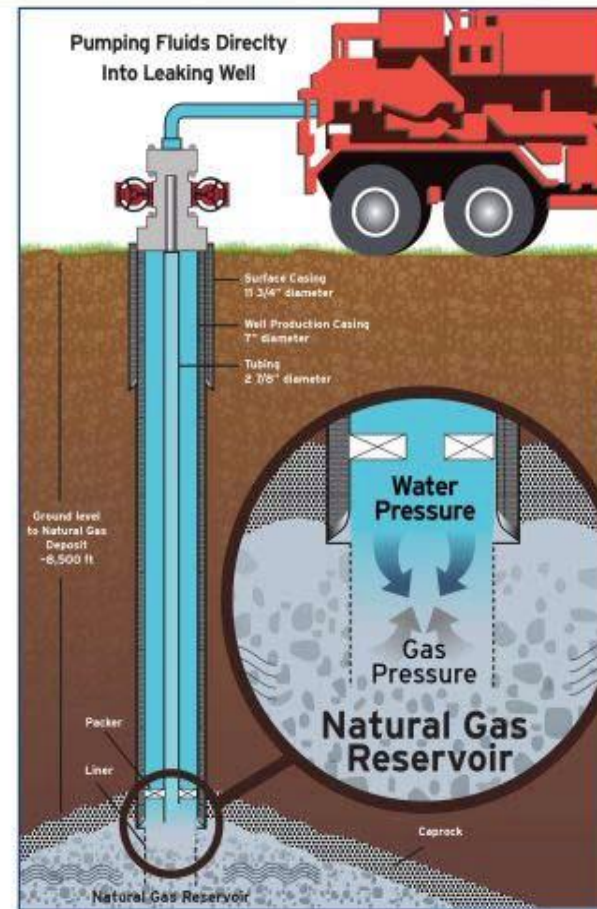
## ALISO CANYON WELL DIAGRAMS



**FIGURE 1**  
Leak Indicators  
Indicators are that natural gas is leaking from the well pipe casing into the ground near the well.



**FIGURE 2**  
Current Efforts to Remedy the Leak  
SoCalGas is constructing a relief well in efforts to stop the natural gas leak. This new relief well will connect to the leaking well and create an entry point through which we will pump fluid to seal the bottom of the leaking well. The relief well is flawless in casing and piping and large in diameter allowing more fluids and cement to be pumped into the well more quickly.



**FIGURE 3**  
Continuing Efforts to Remedy the Leak  
SoCalGas' team of experts will fill the well pipe with enough brine solution to outweigh the pressure of the natural gas, thus stopping the flow of the natural gas from the leak.

# Aliso Canyon – Jackson Prairie Comparisons

<u>Comparison Criteria</u>	<u>Aliso Canyon - Porter Ranch</u>	<u>Jackson Prairie</u>
Storage Reservoir Type	depleted oil field	salt water aquifer
Location Area	Populated	Rural
Age of Field	1953 - 63 years old	1964 - 52 years old
Gas Wells in Field	229	55
Gas Reservoir Depth	8,500'	1,100' to 2,800'
Storage Volume (Bcf)	86 Bcf	46.9 Bcf
Average Flowrate (MMcf/d)	30 MMcf/d	40 MMcf/d
Reservoir Pressure (psig)	2700 psig	500 to 1,300 psig
Gas Odor (mercaptans)	odorized	none
Subsurface Safety Valves (SSV)	failed & removed in 1979	no subsurface safety valves
Surface Safety Valves	unknown	all JP gas wells
Wellbore Integrity	7" casing leak at ~ 990'	all records examined
Cathodic Protection on Casing	uncommon for well casings	protected since 1966
Leak Detection History	temperature & pressure surveys	temperature & noise surveys
Downhole Detection Plans	SoCalGas evaluating	all gas wells in 2016

# Jackson Prairie Regulatory Compliance

- JP is in compliance with all applicable federal and state rules, laws and regulations
- JP is a FERC permitted and regulated gas storage facility
  - FERC approves facility modifications and approves the joint operating agreement amongst the owners
- Washington DNR permits and regulates the natural gas wells drilled at JP
- JP's pipelines and processing facilities are regulated under Title 49 CFR Part 192
  - Adopted and governed by the Pipeline & Hazardous Materials Safety Administration (PHMSA)
  - Enforced by the WUTC's Office of Pipeline Safety
- The Office of Pipeline Safety performs biennial audits at JP
  - results are shared with PHMSA and PHMSA is responsible for taking action as necessary
- On February 5, 2016, PHMSA issued an advisory bulletin encouraging underground storage facility operators to voluntarily implement the recently published American Petroleum Institute's Recommended Practices for Underground Storage (API RP-1171)
  - JP (Janson and Haworth) participated in the development of API RP-1171
  - FERC also participated
  - JP will voluntarily implement API RP-1171
  - JP/PSE will encourage Washington DNR to support PHMSA's advisory bulletin

# Well Integrity Plan

## ***Planned:***

- Plug & abandon (P&A) 4 wells in April 2016
  - FERC application submitted in 2014
  - FERC authorization received in 2015
- Plan to request FERC approval on April 8, 2016 to plug 14 more wells in 2016 and 2017.
- Run noise and temperature logs in all natural gas wells in 2016; included in 2016 O&M plan.
- JP will voluntarily comply with the latest PHMSA natural gas storage advisory bulletin (ABD-2016-02) dated 2/5/2016 and API RP-1171.
- JP will continue to closely follow proposed regulatory changes, and evaluate lessons learned from Aliso Canyon.

## ***Under Consideration:***

- Hire an independent petroleum engineering firm to review JP operations, assess risk exposure, and make recommendations.

# Community Out Reach / Emergency Plan

## ***Community Outreach:***

- JP falls under PSE's companywide public awareness plan
- A biennial community letter to neighbors and public officials are sent out. The next is scheduled for later in 2016
- Biennial first responder outreach is performed locally by staff; last completed in January 2016 with a presentation and tour of the project
- County Commissioners and the Sheriff's Office is very familiar with JP and have made site visits; the State Patrol has made site visits in the past
- JP has hosted meetings of the local Emergency Planning Committee (Mark Anders of JP Chairs the group, which consists of emergency responders from fire, law enforcement, county officials and the Red Cross

## ***Emergency Plan:***

- First responders are familiar with JP through the outreach program
- JP maintains "Jackson Prairie Gas Storage Facility Emergency Response Procedures", which is updated as needed
- JP also maintains a Well Control Contingency Plan that addresses well failures, fires, or other emergencies that can occur during drilling activities